REMARKS

Claims 32, 41, 43, 46 and 49 are amended; claims 36, 37 , 49 and 50 are withdrawn; claims 1-31, 34, 35, 38 and 51-60 are canceled; and claims 32, 33 and 39-48 are pending in the application.

The pending claims stand rejected over Matsuba, Fukunaga, Raaijmakers, Hill, Lee and Kim, in various combinations. Applicant has amended claim 32, from which the remaining claims depend, and believes that such amendments place all of the claims in condition for allowance.

Amended claim 32 recites a method of forming a particle-impregnated electrically conductive material over a semiconductor substrate. The method includes providing a substrate to comprise a substantially planar upper surface, and providing a mixture containing particles in a liquid carrier. The mixture is spread over and directly against the substantially planar upper surface of the semiconductor substrate, and then the liquid carrier is evaporated to leave the particles dispersed over the substantially planar upper surface. Atomic layer deposition is utilized to form a monolayer of metal-containing material over and directly against the dispersed particles. The metal of the monolayer is incorporated into metal silicide or metal nitride. The metal silicide or metal nitride is an electrically conductive material directly against the particle, and the electrically conductive material and particles together are at least part of the particle-impregnated electrically conductive material.

The amendments to claim 32 are supported by the originally-filed specification and therefore do not comprise "new matter." For instance, the recitation of providing a

substrate to comprise a substantially planar upper surface is supported by Fig. 1, and the recitation of spreading a mixture over and directly against such substantially planar upper surface is supported by Fig. 2. The recitation of utilizing atomic layer deposition to form a monolayer of electrically conductive material over and directly against the dispersed particles is supported by Fig. 3, and the text at paragraph 0036 of the specification. The recitations regarding the metal silicide and metal nitride are supported at, for example, paragraph 0037.

Claim 32 is allowable over the cited references for at least the reason that there is no disclosure or suggestion within any combination of the references for the recited spreading of a mixture containing particles in liquid carrier over and directly against a substantially planar upper surface of a semiconductor substrate, evaporation of the liquid carrier, utilization of atomic deposition to form a metal-containing monolayer over and directly against the dispersed particles, and incorporation of the metal into a metal nitride or metal silicide.

The Examiner cites Matsuba, or alternatively Raaijmakers, for showing formation of a particle-impregnated material over a substrate. Applicant notes that Matsuba is disclosing formation of two layers of spheres over a substrate (specifically, spheres 11 and 12 of Figs. 1A-1F). The first layer of spheres is reflowed to form a reflowed layer between the first layer of spheres and an underlying substrate. The spherical materials of Matsuba do not suggest the claim 32 recited particles formed over a substantially planar upper surface and incorporated into particle-impregnated electrically conductive material. Specifically, the first layer of spheres does not remain as particles within a particle-

impregnated material, but rather is reflowed and accordingly loses the individual particle identity of such first spheres; and the second layer of spheres is not provided directly against a substantially planar upper surface, but rather is provided against the non-planar surface corresponding to the upper surface of the first layer of spheres.

The Examiner cites Fukunaga with Matsuba for suggesting the features of claim 32. The cited reference of Fukunaga discloses a spray process for dispersing particles over a substrate. Such process is described as being suitable for forming thin metal films (see, for example, paragraph 0003 of the reference, and Figs. 12, 13 and 16). The reference contains no teaching of forming particles across a substantially planar upper surface, and utilization of atomic layer deposition during formation of a metal-containing material over and directly against the particles to form particle-impregnated electrically conductive material.

The combination of Fukunaga and Matsuba does not render amended claim 32 obvious for at least the reason that there is no teaching within the combined references of forming particles directly against a substantially planar upper surface of a semiconductor substrate, followed by atomic layer deposition of a metal-containing material over and directly against the particles.

Referring next to Raaijmakers, such discloses a method of forming hemispherical grain polysilicon, followed by formation of dielectric material over the hemispherical grain silicon (see, for example, Fig. 7 and the text at paragraph 0146 describing Fig. 7). There is no teaching that the hemispherical grain silicon is formed by spreading a mixture containing particles in liquid carrier across a substantially planar upper surface of a semiconductor

substrate, followed by evaporation of liquid carrier to leave the particles over the substantially planar upper surface. Further, there is no teaching that metal silicide or metal nitride would be formed directly against the hemispherical grain silicon.

The Examiner cites Hill for disclosing that particles can be provided in a mixture comprising liquid, dispersed over a substrate, and then the liquid evaporated; and contends that it would be obvious to combine Hill with Raaijmakers. Applicant notes, however, that Hill like Raaijmakers, discloses formation of dielectric material over the particles (see, for example, paragraph 0028 and Fig. 7 where a dielectric material 70 is formed over the particles). There is no teaching or suggestion within Hill that a metal silicide or metal nitride would be formed to be directly against the particles. The Examiner cites Lee and Kim for showing that metal nitrides and metal silicides were known in the art. Applicant respectfully submits, however, that there would be no motivation for a person of skill in the art to substitute metal silicides and metal nitrides into either the process of Hill or that of Raaijmakers to form a metal silicide or metal nitride directly against the disclosed particles. Rather, Hill and Raaijmakers are both describing processes in which dielectric material is formed over grains of silicon during fabrication of capacitors. There is no suggestion or disclosure that such dielectric materials can be replaced by conductive metal nitrides or metal silicides.

Claim 32 is believed allowable for the reasons discussed above, applicant therefore requests formal allowance of such claim in the Examiner's next action.

Claims 33 and 39-48 depend from claim 32, and are therefore allowable for at least the reasons discussed above regarding claim 32.

Withdrawn claims 36, 37, 49 and 50 depend from claim 32, and applicant therefore requests that such claims be indicated to be allowable in the event that claim 32 is found allowable.

Claims 32, 33 and 36, 37 and 39-50 are believed to be in condition for allowance, and applicant therefore requests that the Examiner's next action be a Notice of Allowance formally allowing all of such claims.

Respectfully submitted,

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By: _____
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